

School of Microelectronics

Program of Microelectronics Science and Engineering for International Students (2023)

I. Introduction

The main objective of the School of Microelectronics is in the direction of integrated circuit chip design and manufacturing, and fosters innovative leading talents oriented to internationalization and industrialization. This discipline is a new engineering discipline developed on many basic disciplines. It is the pioneer and foundation of electronic science and information technology in the 21st century. It is also an important foundation for the development of modern high-tech and national economic modernization. Mainly researching the design and manufacturing technology of semiconductor devices and VLSI, and closely integrating with the industry. The School of Microelectronics will closely cooperate with the electronic engineering departments of famous universities in the Great Bay Area, as well as many leading enterprises in Shenzhen's local electronic information direction. Also will cooperate with the four research directions of EDA, VLSI-SoC, wide WBG semiconductor, and future communication. Therefore, the project is different from the existing microelectronics disciplines, and will further explore new engineering construction oriented by internationalization and industrialization.

Program code: 080704

II. Objectives and Learning Outcomes

1. Objectives

The Microelectronic Science and Engineering major aims to provide students not only solid theoretical knowledge in semiconductor materials and devices, but also intends to the cultivate innovative leading talents capable of manufacturing and designing integrated circuit chips.

2. Learning Outcomes

The students can participate in microelectronics science and engineering courses offered by

university teachers in Hong Kong and Macau at SUSTech, as well as internship courses. After graduating, the students can work in the design of electronic components manufacturing, integrated circuits and systems in various related enterprises, or they can continue their studies or research in famous universities in the Great Bay Area.

III. Study Length, Degree, and Graduation Requirements

1. Study length: 4 years.

2. Degree conferred: Students who complete and meet the degree requirements of the undergraduate program will be awarded a bachelor's degree in Engineering

3. The minimum credit requirement for graduation: 156 credits. The specific requirements are as follows.

Module		Category	Minimum Credit Requirement
General Education Courses	Chinese Language and Culture Module	Chinese Language and Culture	16
	Arts and Physical Education Module	Physical Education	4
		Arts	2
	Competence Development Module	Computer Programming	3
		Writing	2
		Foreign Languages	14
	Humanities and Social Sciences Module	Humanities	6
		Social Sciences	
		Chinese Studies	2
	Mathematics and Natural Sciences Module	Mathematics	12
		Physics	10
		Chemistry	3
		Geoscience + Life science	3
GE to Majors Bridging Module	Introduction to Majors	2	
Major Courses	Major Required Courses	Major Foundational Courses	22
		Major Core Courses	22
		Practice-based Learning (Undergraduate Thesis, Internships, Research projects, etc.)	14
	Major Elective Courses	Major Elective Courses	19
Total			156

Note: please see the General Education Requirement for more details on Chinese Language and Culture Module, Arts and Physical Education Module, Competence Development Module (Foreign Languages & Writing) , Humanities and Social Sciences Module, and GE to Majors Bridging Module.

IV. Course Requirements for the Mathematics and Natural Sciences Module and Computer Programming

Course Category	Course Code	Course Name	Credits	Terms	Prerequisite	Dept.
Mathematics	MA117	Calculus I	4	1Fall	NA	MATH
	MA127	Calculus II	4	1Spr	Ma117	MATH
	MA113	Linear Algebra	4	1Spr/Fall	NA	MATH
Physics	PHY105	College Physics I	4	1Fall	NA	PHY
	PHY106	College Physics II	4	1Spr	PHY105	PHY
	PHY104B	Experiments of Fundamental Physics	2	1-2Spr/Fall 1	NA	PHY
Chemistry	CH105	Chemistry: The Central Science	3	1-2Spr/Fall 1	NA	CH
Biology	BIO102B	Introduction to Life Science	3	1-2Spr/Fall 1	NA	BIO
Computer Programming	CS111	Introduction to C Programming	3	1-2Spr/Fall 1	NA	CSE

Note:

1. Mathematics: MA101a Mathematical Analysis I and MA102a Mathematical Analysis II can replace MA117 Calculus I and MA127 Calculus II; MA118 Single-variable Calculus can replace MA113 Linear Algebra.
2. Physics: PHY101 General Physics I and PHY102 General Physics II can replace PHY105 College Physics I and PHY106 College Physics II.
3. Chemistry: CH103 General Chemistry can replace CH105 Chemistry: The Central Science.
4. Biology: BIO103 Principles of Biology can replace BIO102B Introduction to Life Science.
5. The replace courses above also applicable to the " Prerequisites for Major Declaration ".

V. Prerequisites for Major Declaration

Major Declaration Time	Course Code	Course Name	Prerequisite
Declare major at the end of the first academic year	SME101	Introduction to Integrated Circuit	NA
	SME102	Fundamentals of Microelectronics and Integrated Circuit	NA
	MA117	Calculus I	NA
	MA127	Calculus II	Calculus I
	MA113	Linear Algebra	NA
	PHY105	College Physics I	NA
	PHY106	College Physics II	College Physics II
	PHY104B	Experiments of Fundamental Physics	NA
	CS111	Introduction to C programming	NA
Note: 1.Choose either SME101 or SME102 to complete; 2.At least complete two of "MA113,PHY104B,CS111".			
Declare major at the end of the second academic year	SME101	Introduction to Integrated Circuit	NA
	SME102	Fundamentals of Microelectronics and Integrated Circuit	NA
	MA117	Calculus I	NA
	MA127	Calculus II	Calculus I
	MA113	Linear Algebra	NA
	PHY105	College Physics I	NA
	PHY106	College Physics II	College Physics II
	PHY104B	Experiments of Fundamental Physics	NA
	CS111	Introduction to C programming	NA
	CH105	Chemistry: The Central Science	NA
	BIO102B	Introduction to Life Science	NA
Note: 1.Choose either SME101 or SME102 to complete.			
Note: 1. If the number of students entering a major at the end of the first academic year in the department is greater than or equal to the total number of the teaching-research faculty (PI)*2*60%, all majors in the department may implement the prerequisites for major declaration at the end of the second academic year. 2. If the number of students entering a major at the end of the first academic year in the department is less than the total number of the teaching-research faculty (PI)*2*60%, all majors in the department do not implement the prerequisites for major declaration at the end of the second academic year. 3. Suppose the number of students applying for a major at the end of the first academic year exceeds four times the total number of the teaching-research faculty (PI), then the department may select students according to predetermined rules. In principle, the rules set by the department shall examine the students' suitability for the major and not based on weighted GPA (Specific rules shall be set by the department and announced in advance). 4. For departments that do not implement prerequisites for major declaration at end of the second academic year, if the cumulative number of students applying for a major at the end of the second academic year and the number of students who have entered a major at the end of the first academic year exceeds four times the total number of the teaching-research faculty (PI), the department may select students according to predetermined rules. In principle, the rules set by the department shall examine the students' suitability for the major and not based on weighted GPA (Specific rules shall be set by the department and announced in advance).			

VI: Major Course Arrangement

Table 1: Major Required Courses

Program of Microelectronic Science and Engineering

Course Category	Course Code	Course Name	Credits	Practice-based Learning Credits	Terms	Prerequisite	Dept.
Major Foundational Courses	SME103	Fundamentals of Circuit Analysis	2		1Spr	MA127 MA113	SME
	SME201	Fundamentals of Integrated Circuit I - Analog Integrated Circuit	4	1	2 Fall/Spr	SME102 SME103	SME
	SME202	Fundamentals of Integrated Circuit II -Digital Integrated Circuit	4	1	2 Fall/Spr	SME102 SME103 PHY106	SME
	SME203	Fundamentals of Microelectronics I- -Semiconductor Material Physics	3		2 Fall/Spr	SME102 SME103 PHY106	SME
	SME204	Fundamentals of Microelectronics II -Semiconductor Device	3	1	2 Fall/Spr	SME203	SME
	SME205	Electromagnetic Field and Electromagnetic Wave	3		2 Fall/Spr	PHY106	SME
	SME206	Signals and Systems	3	1	2 Fall/Spr	MA117	SME
	Total			22			
Major Core Courses	SME303	Advanced Microelectronics Experiment I	1	1	2Fall	NA	SME
	SME305	VLSI Fabrication Technology	3	1	3 Fall/Spr	NA	SME
	SME306	Advanced Digital CMOS IC Design	3	2	3 Spr	SME202 SME204	SME
	SME307	CMOS Analog Integrated Circuit Design	3	1	3 Fall	SME201 SME204	SME
	SME309	Microprocessor Design	3	1	3 Fall	SME202	SME
	SME318	Micro and Nano Electromechanical Systems	3	1	3 Spr	PHY106	SME
	SME319	Fundamentals of Semiconductor Devices and Packaging	3		3 Spr	SME204	SME
	SME321	Introduction to GaN Semiconductor Materials and Devices	3		3 Fall	NA	SME
Total			22				
Practice-based Courses	SME470	Internship	2	2	3Smr	NA	SME
	SME491	Graduation Projects/Thesis	12	12	4Fall/Spr	NA	SME
	Total			14			
Total			58	25			

Note:

- 1.The SME103 can be substituted with the EE104 .
- 2.The SME206 can be substituted with the EE205 .
- 3.One of the SME303,304,403 should be counted as core course credit, while major elective course others;
- 4.Students who have completed Comprehensive Design I & II (COE491&COE492) are not required to take the Graduation Projects/Thesis (SME491).

Table 2: Major Elective Courses**Program of Microelectronic Science and Engineering**

Course Code	Course Name	Credits	Practice-based Learning Credits	Terms	Prerequisite	Dept.
SME301	Frontier Seminars in Microelectronics and IC Designs I	1		3Fall	NA	SME
SME302	Frontier Seminars in Microelectronics and IC Designs II	1		3Spr	NA	SME
SME304	Advanced Microelectronics Experiment II	1	1	2Fall/Spr	NA	SME
SME308	Advanced Semiconductor Fabrication Laboratory	3	1.5	3Fall/Spr	SME204	SME
SME310	Deep Learning on Chip	3	1	3Spr	SME202	SME
SME311	The Foundation of IC Layout Design	1	1	3Spr	SME306	SME
SME312	Electronic Design Automation (EDA) Basics	3	1	3Spr	SME103	SME
SME313	Design of CMOS Radio Frequency Integrated Circuits	3	1	3Spr	SME307	SME
SME314	Biosensor Basics and DNA Sequencing Application	3		3Spr	SME204 or CH105	SME
SME315	Design of Micro and Nano Sensors	3		3Fall	PHY106	SME
SME317	System-on-a-Chip Design	3	1	3Fall	SME202	SME
SME323	Principle of Nano-optics	3		3Fall	NA	SME
SME325	Introduction to Power Electronics	3		3Fall	SME201	SME
SME327	Introduction to Si Based Quantum Computing (QC) Devices	1		3Fall	PHY206-15 or SME204	SME
SME401	Frontier Seminars in Microelectronics and IC Designs III	1		4Fall	NA	SME
SME402	Frontier Seminars in Microelectronics and IC Designs IV	1		4Spr	NA	SME
SME403	Advanced Microelectronics Experiment III	1	1	4Fall	NA	SME
SME405	Advances in Micro Energy and Micro Sensing	2	1	3Fall	NA	SME
SME480	Projects of Science and Technology Innovation	2	2	4Fall	NA	SME
SMES201	An Introduction of Machine Learning and EDA	2		2Smr	NA	SME
SMES202	Patent Basics for Scientists and Engineers	1		2Fall	NA	SME
SMES203	Fundamentals of Power IC Design	3		2Smr	NA	SME
SMES204	Introduction to Nanoelectronics	2		2Smr	NA	SME
SMES205	Fundamentals of Semiconductor Materials	2		2Smr	NA	SME
SMES206	Selected Small Size Integrated Circuit Devices	1		2Smr	SME204	SME
SMES207	Microelectronics Technology, Industry and Policy Strategy	1		2Smr	NA	SME
SMES208	Analysis Practice of Integrated Circuit Dissection	1		2Smr	SME204	SME
EE313	Wireless Communications	3	1	3Fall	EE206	EE
EE316	Microwave Engineering	3	1	3Fall	EE104 EE201-17 EE208	EE
EE322	Optoelectronic Devices Fabrication	2	1	3Spr	EE204	EE

EE323	Digital Signal Processing	3	1	3Fall	EE205	EE
EE326	Digital Image Processing	3	1	3Spr	EE205	EE
EE332	Digital System Design	3	1	3Spr	EE202-17	EE
EE345	Introduction of Wide Bandgap Semiconductors	3		3Fall	EE203 or EE204	EE
EE404	Organic Electronics	2		4Spr	NA	EE
EE411	Information Theory and Coding	2		4Fall	MA212	EE
MSE334	Introduction to Energy Materials	2		3Spr	PHY106 PHY104B MSE001	MSE
MSE320	Introduction to Photovoltaic Thermal Technology	3		3Spr	PHY106 EE201-17 EE204	MSE
MSE413	3D Printing and Laser-based Advanced Manufacturing	3		3Fall	NA	MSE
CH212-16	Advanced Instrumentation Systems I	4	2	2-3Spr	CH103	CH
CH304	Nanomaterials Synthesis and Nanotechnology	2		3Spr	CH202 CH302	CH
CH306	Laboratory for Micro-Nano Synthesis, Technology and Application	2	2	3Spr	CH202 CH302	CH
ESE212	Environment Monitoring	2		2Spr	NA	ESE
ME102	CAD and Engineering Drawing	3	1.5	1Fall/Spr	NA	ME
ME310	Fundamentals of Measurement Technology	3		3Spr	EE205 ME307	ME
CS205	C/C++Program Design	3	1	2Fall	NA	CS
CS203B	Data Structures and Algorithm Analysis B	3	1	2Fall	CS109 or CS110	CS
CS401	Intelligent Robot	3	1	3Spr	CS109 CS203BB MA212	CS
MAE202	Mechanics of Materials	3		2Spr	MAE203	MAE
MAE303	Fluid Mechanics	4		3Fall	MAE204	MAE
MAE305	Engineering Thermodynamics	3		3Fall	NA	MAE
BMEB131	Introduction to Biomedical Engineering	2		1Fall	NA	BMEB
MA233	Introduction to MATLAB	4	1	1Spr	MA113	MA
MA201b	Ordinary Differential Equations B	4		2Fall	MA102B	MA
MA202	Complex Analysis	3		2Spr	MA203a or MA213	MA
MA206	Mathematical Modelling	3	1	2Spr	MA203a or MA213	MA
MA212	Probability Theory and Statistics	3		2Spr	MA127 or MA117	MA
MA303	Partial Differential Equations	3		3Fall	MA201A	MA
MA305	Numerical Analysis	3		3Fall	MA203a or MA213	MA
PHY206-15	Quantum Mechanics I	3		2Spr	PHY205-15 PHY203-15	PHY
Total		147	28			

Notes:

1.Required to complete 19 credits for the major elective courses;

2.Courses set up beyond the program from SME can be recognized as elective credits.

Table 3: Overview of Practice-based Learning**Program of Microelectronic Science and Engineering**

Course Code	Course Name	Credits	Practice-based Learning Credits	Terms	Prerequisite	Dept.
SME201	Fundamentals of Integrated Circuit I - Analog Integrated Circuit	4	1	2 Fall/Spr	SME103 PHY106	SME
SME202	Fundamentals of Integrated Circuit II -Digital Integrated Circuit	4	1	2 Fall/Spr	SME103 PHY106	SME
SME204	Fundamentals of Microelectronics II -Semiconductor Device	3	1	2 Fall/Spr	SME203	SME
SME206	Circuits and Systems	3	1	2 Fall/Spr	MA127 MA113 SME103	SME
SME303	Advanced Microelectronics Experiment I	1	1	2Fall	NA	SME
SME304	Advanced Microelectronics Experiment II	1	1	2Fall/Spr	NA	SME
SME305	VLSI Fabrication Technology	3	1	3 Fall/Spr	无	SME
SME306	Advanced Digital CMOS IC Design	3	2	3 Spr	SME202 SME204	SME
SME307	CMOS Analog Integrated Circuit Design	3	1	3 Fall	SME201 SME204	SME
SME308	Advanced Semiconductor Fabrication Laboratory	3	1.5	3Fall/Spr	SME204	SME
SME309	Microprocessor Design	3	1	3 Fall	SME202	SME
SME310	Deep learning on chip	3	1	3Spr	SME202	SME
SME311	The Foundation of IC Layout Design	1	1	3Spr	SME306	SME
SME312	Electronic Design Automation (EDA) Basics	3	1	3Spr	SME103	SME
SME313	Design of CMOS Radio Frequency Integrated Circuits	3	1	3Spr	SME307	SME
SME317	System-on-a-Chip Design	3	1	3Fall	SME202	SME
SME318	Micro and Nano Electromechanical Systems	3	1	3 Spr	PHY106	SME
SME403	Advanced Microelectronics Experiment III	1	1	4Fall	NA	SME
SME405	Advances in Micro Energy and Micro Sensing	2	1	3Fall	NA	SME
SME470	Internship	2	2	3Smr	NA	SME
SME480	Projects of Science and Technology Innovation	2	2	4Fall	NA	SME
SME491	Graduation Projects/Thesis	12	12	4Spr	NA	SME
SMES208	Analysis Practice of Integrated Circuit Dissection	1		2Smr	SME204	SME
EE313	Wireless Communications	3	1	3Fall	EE206	EE
EE316	Microwave Engineering	3	1	3Fall	EE104 EE201-17 EE208	EE
EE322	Optoelectronic Devices Fabrication	2	1	3Spr	EE204	EE
EE323	Digital Signal Processing	3	1	3Fall	EE205	EE
EE326	Digital Image Processing	3	1	3Spr	EE205	EE
EE332	Digital System Design	3	1	3Spr	EE202-17	EE
EES202	Design based on LabVIEW Programming	1	1	2 Spr	无	EE
CH212-16	Advanced Instrumentation Systems I	4	2	2-3Spr	CH103	CH
ME102	CAD and Engineering Drawing	3	1.5	1Fall/Spr	NA	ME

CS205	C/C++Program Design	3	1	2Fall	NA	CS
CS203B	Data Structures and Algorithm Analysis B	3	1	2Fall	CS109 or CS110	CS
CS401	Intelligent Robot	3	1	3Spr	CS109 CS203BB MA212	CS
MA233	Introduction to MATLAB	4	1	1Spr	MA113	MA
MA206	Mathematical Modelling	3	1	2Spr	MA203a or MA213	MA
Total		108	52			

Curriculum Structure of Microelectronics Science and Engineering

